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EXAMINER

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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/755,708
Filing Date: January 12, 2004
Appellant(s): FERNALD ET AL.

Randol W. Read
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed February 21, 2007 appealing from the Office action mailed September 22, 2006.

(1) Real Party in Interest

The statement of the status of claims contained in the brief is correct.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

GROUND OF REJECTION NOT ON REVIEW

The following grounds of rejection have not been withdrawn by the examiner, but they are not under review on appeal because they have not been presented for review in the appellant's brief. Independent claim 13, the broadest in the case, and its dependent claims 14-20 stand finally rejected and are not presented for review.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6033515	Walters et al.	3-2000
5157751	Maas et al.	10-1992
2003/0223712	Chapman et al.	12-2003
2003/0108307	Eskildsen et al.	6-2003
2003/0117856	Huang et al.	3-2005

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims.

I. Claims 13 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Walters (6,033,515) in view of Maas et al. (5,157,751).

Claims 13 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Walters (6,033,515) in view of Maas et al. (5,157,751). It is noted that claim 10 depends on claim 1; hence the subject matter of claim 1 is inherently included in claim 10. Claim 1 is rejected under this same art in other grounds of rejection. However, it was not included in this statement of the grounds of rejection due to a typographical error.

Walters teaches a method and apparatus for fusion splicing of an optical fiber (e.g. a first waveguide section) and large optical device (e.g. a second waveguide section), which has a much larger cross section than standard optical fibers. Walters teaches that the two optical components (e.g. 16, and 14) are aligned along one axis and employing a split laser beam (e.g. the two laser beams 10) with an adjusted power level for such fusion splicing an optical fiber (14) to a large optical element (16) such as “a lens, filter, grating, prism, WDM device, or other such optical component to which it is desired to secure the optical fiber 14” (Col. 6, ll. 20-22). Further, it is noted that Walters expressly defines “significantly different” cross-section as being at least two times larger. (See e.g. Col. 1, ll. 25-66, Col. 5, ll. 20 – Col. 6, ll. 25 and Fig. 1.)

However, Walters does not explicitly teach that the optical fiber (14) comprises a core and cladding and that the second waveguide section may not necessarily comprise an optical fiber. As it is notoriously well known in the art—for example as taught by Maas et al. 5,157,751 in e.g. Fig. 3 and Col. 3, ll. 5-15—that optical fibers (including these joined together) may comprise a cladding, it would have been obvious to one of ordinary skill in the art at the time of the

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invention that the fiber in the invention of Walters may have a cladding. Similarly, it is notoriously well known in the art that it is common to align fiber cores during splicing – for example as taught by Maas et al. (5,157,751) in claim 4. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to align the cores of fibers during splicing and one would have been motivated to do so because it would provide an efficient connection between the fibers. One would have been motivated to employ a cladding to increase the efficiency of light transmission within the fiber connection.

Walters does not explicitly teach splicing two optical fibers. Rather, Walters teaches a more general device that is capable of “fusion splicing an optical fiber (14) to a large optical element (16) such as “a lens, filter, grating, prism, WDM device, or other such optical component to which it is desired to secure the optical fiber 14” (Col. 6, ll. 20-22). Further, Walters also recognizes that a silica rod collimator—which would inherently have a distal end and a core—may be fusion spliced to an optical fiber. (See Col. 1, ll. 38-44)

As splicing optical fibers is notoriously well known in the art – as taught for example, by Maas et al. (5,157,751) in claim 4 – it would have been obvious to one of ordinary skill in the art at the time of the invention to employ the invention of Walters to splice two optical fibers because as Walters teaches, the device of Walters may efficiently join large optical waveguide sections.

II. Claims 13 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chapman et al. (2003/0223712) in view of Maas et al. (5,157,751).

Claims 13 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chapman et al. (2003/0223712) in view of Maas et al. (5,157,751). Chapman et al. (2003/0223712) teaches a method and apparatus for placing two optical fibers in at least two

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stages wherein the stages allow movement of the fibers relative to each other: aligning distal ends of two optical fibers (12 and 14), then cleaving the end of an optical fiber (12) with a first laser (16), next cleaving the end of a second fiber (14) with a second laser (18), and following, fusing the two fibers together with a third laser (22). (See e.g., paragraphs 16-21 and Fig. 3) Additionally, the fibers may have a coating or cladding (e.g. 20). Chapman further teaches that the third laser beam (26) may be split into multiple component beams via a splitter device (79) to impinge on the two fibers, thereby forming a fusion splice. It is additionally taught that the laser power maybe controlled by a feedback mechanism. (See e.g. paragraphs 16 - 25 and Fig. 3.)

Chapman does not explicitly teach aligning the optical fiber cores prior to joining said fibers. However, as it is notoriously well known in the art that it is common to align fiber cores during splicing – for example as taught by Maas et al. (5,157,751) in claim 4; it would have been obvious to one of ordinary skill in the art at the time of the invention to align the cores of fibers during splicing and one would have been motivated to do so because it would provide an efficient connection between the fibers.

III. Claims 1-3, 6, 7, 9, 12-18, and 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chapman et al. (2003/0223712) in view of in view of Maas et al. (5,157,751), in further view of Walters (6,033,515).

Claims 1-3, 6, 7, 9, 12-18, and 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chapman et al. (2003/0223712) in view of in view of Maas et al. (5,157,751), in further view of Walters (6,033,515). Claim 23 depends on claim 21; hence the subject matter of claim 21 is inherently included in claim 23. Claim 21 was finally rejected under this same art in other grounds of rejection. However, it was not included in the statement of the grounds of rejection here due to a typographical error.

Chapman in view of Maas et al. (5,157,751) teaches a method and apparatus for splicing two optical fibers as discussed above. However, Chapman does not explicitly teach that at least one of the fibers has a diameter greater than 400 micrometers.

Walters in view of Maas et al. (5,157,751) teaches fusion splicing of fibers and large optical devices, which have a much larger cross section than standard optical fibers as discussed above.

Chapman teaches employing two laser sources for preparing an optical fiber for fusion splicing is advantageous because it allows a high reliability and control of the heat source (see e.g. p. 25). It would have been obvious to one of ordinary skill in the art at the time of invention to employ two beams to connect optical components – such as those with a 400 um and grater diameter – to each other as is taught by Walters in the method and device of Chapman to splice two larger (e.g. multimode) fibers or a single mode to a multimode fiber – e.g. optical waveguide sections with different and/or large cross-section diameters. One of ordinary skill in the art at the time of the invention would have been motivated to do so because the power output provided to the two fibers – of potentially different sizes – could be controlled more precisely, thus yielding an efficient splicing method and apparatus for large diameter waveguide sections.

IV. Claims 1-3, 6, 7, 9, 12-18, and 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chapman et al. (2003/0223712) in view of in view of Maas et al. (5,157,751), in further view of Walters (6,033,515).

Claims 1-3, 6, 7, 9, 12-18, and 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chapman et al. (2003/0223712) in view of in view of Maas et al. (5,157,751), in further view of Walters (6,033,515). Claim 23 depends on claim 21; hence the subject matter of claim 21 is inherently included in claim 23. Claim 21 was finally rejected under this same art

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in other grounds of rejection. However, it was not included in the statement of the grounds of rejection here due to a typographical error.

Chapman in view of Maas teaches a method and apparatus for splicing two optical fibers as discussed above. However, Chapman does not explicitly teach that at least one of the fibers has a diameter greater than 400 micrometers.

Walters in view of Maas et al. (5,157,751) teaches fusion splicing of fibers and large optical devices, which have a much larger cross section than standard optical fibers as discussed above.

Chapman teaches employing two laser sources for preparing an optical fiber for fusion splicing is advantageous because it allows a high reliability and control of the heat source (see e.g. p. 25). It would have been obvious to one of ordinary skill in the art at the time of invention to employ two beams to connect optical components – such as those with a 400 um and grater diameter – to each other as is taught by Walters in the method and device of Chapman to splice two larger (e.g. multimode) fibers or a single mode to a multimode fiber – e.g. optical waveguide sections with different and/or large cross-section diameters. One of ordinary skill in the art at the time of the invention would have been motivated to do so because the power output provided to the two fibers – of potentially different sizes – could be controlled more precisely, thus yielding an efficient splicing method and apparatus for large diameter waveguide sections.

V. Claims 1, 4, 5, 13, 20, 21, 27, 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chapman et al. (2003/0223712) in view of Maas et al. (5,157,751), in further view of Walters (6,033,515), in further view of Eskildsen et al. (2003/0108307).

Claims 1, 4, 5, 13, 20, 21, 27, 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chapman et al. (2003/0223712) in view of Maas et al. (5,157,751), in further

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view of Walters (6,033,515), in further view of Eskildsen et al. (2003/0108307). Chapman et al. (2003/0223712) in view of Maas et al. (5,157,751), in further view of Walters (6,033,515), teaches a method and apparatus for fusion splicing optical fibers as discussed above.

Eskildsen et al. (2003/0108307) teaches an apparatus and method for aligning two fibers for fusion splicing and subsequently evaluating the loss of the resulting splice. Eskildsen teaches that a power monitoring may be accomplished automatically by transmitting optical power through the fibers and detecting the power after traversing the fusion splice. Following, the detected power may be used as a feedback signal to adjust the lateral position of the fibers. (See e.g. p. 13) Eskildsen also teaches that the loss of the resulting spliced fiber may be measured via similar methods. (See e.g. p. 16) While Chapman in view of Walters in view of Eskildsen does not explicitly teach splicing fibers with reflective gratings, such fibers are commonly used in the art and could be incorporated in these inventions.

Chapman in view of Walters does not explicitly teach detecting light passing through a spliced region or the specific signal processing employed. It would have been obvious to one of ordinary skill in the art at the time of the invention to employ alignment and analysis systems and methods as taught by Eskildsen in the invention Chapman in view of Walters. One would have been motivated to make such a combination because it would yield an efficient means for fusion splicing optical fibers.

VI. Claims 1, 8, 10, 11, 13, 19, 21, 26, 29, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chapman et al. (2003/0223712) in view of Maas et al. (5,157,751), in further view of Walters (6,033,515) in further view of Huang et al. (2005/0117856).

Claims 1, 8, 10, 11, 13, 19, 21, 26, 29, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chapman et al. (2003/0223712) in view of Maas et al. (5,157,751), in

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further view of Walters (6,033,515) in further view of Huang et al. (2005/0117856). Chapman in view of Maas et al. (5,157,751), in further view of Walters teaches a method and apparatus for fusion splicing optical fibers as discussed above.

Huang et al. (2005/0117856) teaches an apparatus and method of splicing optical fibers wherein mechanical and electrical shutters may control the exposure of laser light to a fusion splice region. Huang additionally teaches that a laser may be applied to the fibers so that the fiber ends become soft and are slightly deformed – thus forming a curvature. Huang teaches that this is beneficial for the fusion process. (See e.g. p. 28-37) Huang additionally teaches that visible laser beams may be employed in alignment of fibers in fusion splicing. (See e.g. p. 8)

Chapman in view of Walters does not explicitly teach employing a shutter device to control the laser. It would have been obvious to one of ordinary skill in the art at the time of the invention to employ a shutter device because shutter device are commonly used in the laser art to control laser beams as, for example, taught by Huang in the invention of Chapman in view of Walters because this would allow controlled application of the laser beam. One would have been motivated to do so because it would yield an efficient method and device, for example it would provide protection from inadvertent exposure of the laser.

Chapman in view of Walters does not explicitly teach applying a laser to the fibers to provide a curvature to their distal ends. It would have been obvious to one of ordinary skill in the art at the time of invention to incorporate the splicing techniques such as applying a laser to the fibers thus providing a curvature to their distal ends. One would have been motivated to do so because it would yield an efficient fusion splice.

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Chapman in view of Walters does not explicitly teach employing a visible laser beam during alignment of the fiber splice. It would have been obvious to one of ordinary skill in the art at the time of invention to incorporate an alignment system as taught by Huang, including splitting the visible beam, in the invention of Chapman in view of Walters. One would have been motivated to do so because it would yield an efficient manner for aligning the fibers.

Chapman in view of Walters does not explicitly teach employing a lathe in the fusion process. It would have been obvious to one of ordinary skill in the art at the time of invention to incorporate a lathe for rotating the fibers in the invention of Chapman in view of Walters. One would have been motivated to do so because it would yield an efficient manner for aligning the fibers; for example, it would allow uniform heating of the splice region.

(10) Response to Argument

I. Applicant unpersuasively argues that claim 10 is non-obvious over Walters in view of Maas.

It is noted that claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Walters (6,033,515) in view of Maas et al. (5,157,751). Claim 10 depends on claim 1; hence the subject matter of claim 1 is inherently included in claim 10. Claim 1 was Finally Rejected under this same art in other grounds of rejection. However, it was not included in the statement of the grounds of rejection here due to a typographical error.

Applicant provides three arguments for non-obviousness, none of which are persuasive. First, applicant argues that under the teaching of Walters in view of Maas, it would not have been obvious to combine two waveguide sections at their distal ends because the large optical element such as a collimating lens, filter, grating, prism, wavelength division multiplexer

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(WDM) device, or any other component of comparative larger cross-sectional area (See Col. 2, ll. 24-30 of Walters) as taught by Walters “do not have distal ends.” (See p. 12, ¶ 2 of the Appeal Brief.) This argument is not persuasive for many reasons. The claim is rejected under Walters in view of Maas. As addressed in the final rejection, Maas teaches the laser fusion splicing of two optical fibers, which are aligned at their respective distal ends. Therefore, Walters in view of Maas meets the distal end limitation. Additionally, Walters recognizes that a silica rod collimator—which would inherently have a core and distal end—may be fusion spliced to an optical fiber. (See Col. 1, ll. 38-44.) Further, one of ordinary skill in the art would recognize, as taught independently by Walters and Maas, that when connecting light output from a first waveguide to a second waveguide device (such as a fiber, lens, grating, prism, etc...), it would be advantageous to use a suitable input end of the second waveguide, such as a distal end.

Second, applicant argues that Walters in view of Maas does not teach “aligning the cores of **two large diameter waveguides** ... to achieve a low loss optical splice.” (Emphasis added) (See p. 12, ¶ 3 of the Appeal Brief.) This argument is not persuasive because neither the structural limitation of “two large diameter waveguides”, nor the functional language of “to achieve a low loss optical splice” is recited in claims 1 or 10. Regarding the “two large diameter waveguides” limitation; claim 1 only recites “**at least one** of the optical waveguide sections has an outer diameter greater than 400 micrometers” (Emphasis added) (See claim 1, ll. 2-3) without recitation to the second fiber’s size. Additionally, regarding alignment of the fiber cores, as addressed in the final rejection, Maas teaches the laser fusion splicing of two fibers with their cores co-axially aligned. (See claim 4.)

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Third, applicant argues that claims 1 and 10 are not obvious over Walters in view of Maas because of technical difficulties. Applicant argues “according to paragraph [0005] the present application, conventional techniques for fusion splicing of optical fiber are typical limited to fiber diameter of 400 um or less.” And that “modifying ... [conventional] techniques to accommodate large diameters of optical waveguides ... would present a challenge and may not be feasible, particularly when trying to maintain uniform heating” (See p. 12 ¶ 2 – p. 13 ¶ 1 of the Appeal Brief.)

This argument is not persuasive because Walters addresses this very same technical challenge—uniform heating of the two components. Walters discloses, as background, that previous fiber-fiber and fiber-waveguide fusion splicing techniques of two small, similarly sized, components did not need careful thermal balance between the two components. Thus, it can be done via laser beam impinging from the side. However, this method has not been feasible for connecting a fiber to another waveguide with a significantly different cross-section. (See Col. 1, ll. 30-55.) Walters’ fusion splicing method overcomes the previous challenges, in part, by not employing laser side impingement. Thereby, it allows for thermal management of each component. Further it is noted that Walters expressly defines “significantly different” cross-section as being at least two times larger. (See e.g. Col. 2, ll. 23-67; Col. 3, ll. 40-45; Col. 4, ll. 58-63.)

II. Applicant unpersuasively argues that claims 1-3, 6-7, 9, 12 and 23-25 are non-obvious over Chapman in view of in view of Maas, in further view of Walters.

It is noted that claim 23 depends on claim 21; hence the subject matter of claim 21 is inherently included in claim 23. Claim 21 was Finally Rejected under this same art in other

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grounds of rejection. However, it was not included in the statement of the grounds of rejection here due to a typographical error.

It is noted that Maas (5,157,571) was introduced in this grounds of rejection to overcome applicant's amendment and argument after a Non Final Rejection. Applicant argued that Chapman did not teach that the cores of optical fibers are aligned during fusion splicing. Maas teaches this notoriously well-known concept in claim 4. Applicant has dropped this argument on appeal.

Applicant provides three arguments for non-obviousness, none of which are persuasive. First, applicant repeats the technical difficulty argument regarding uniform heating of the two optical elements addressed above. (See p. 14 ¶ 3 – p. 15 ¶ 3 of the Appeal Brief.) Chapman in view of Walters overcomes the technical problems raised Walters and echoed by applicant. Walters teaches the laser applied collinear to the axis of the small fiber's core such that "laser light is not absorbed by the small fiber, but is reflected off [its] surface" thereby, providing individual thermal control of each competent. Further, Walters teaches "ensuring that the laser beam strikes the larger cross sectional area optical element at normal or near normal incidence so that absorption of the laser is much more efficient on the larger surface; [next] adjusting the laser power level to reach a temperature equal to or higher than the softening temperature on the surface of the element to achieve fusion-splicing." (See e.g. Col. 5, ll. 5-25) Thus, Walters overcomes the thermal limitations identified in the background of Walters and echoed by applicant's argument.

Further it Chapman recognizes the need for splitting a laser beam—similar to Chapman further teaches that the third laser beam (26) may be split into multiple component beams via a

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splitter device (79) to impinge on the two fibers, thereby forming a fusion splice. It is additionally taught that the laser power maybe controlled by a feedback mechanism. (See e.g. paragraphs 16 - 25 and Fig. 3)

Second, applicant argues that the second—larger—waveguide of Walters does not comprise a core and a cladding. (See p. 14 ¶ 3 – p. 15 ¶ 3 of the Appeal Brief.) While Walters does not explicitly teach that the significantly larger waveguide comprises an optical fiber with a core and cladding, Walters does teach large optical element such as a collimating lens, filter, grating, prism, wavelength division multiplexer (WDM) device, or any other component of comparative larger cross-sectional area. (See Col. 2, ll. 24-30 of Walters.) Further, Walters recognizes that a silica rod collimator—which would inherently have a core and distal end—may be fusion spliced to an optical fiber. (See Col. 1, ll. 38-44.) As addressed in the Final Rejection, it would have been obvious in the invention of Chapman in view of Maas, in further view of Walters that optical fibers have may have a cladding, which is notoriously well known in the art and taught by Chapman and Mass.

Additionally, **applicant's argument regarding a cladding is not explicitly enabled or supported** by the originally filed disclosure. There is no discussion of thermal control or fusion splicing a fiber with a cladding in the application. In fact, the words “clad or cladding” are not included in the original disclosure. Applicant added these limitations on June 14, 2006 in response to a Non Final Rejection. **It is questionable if these amendments are enabled or supported; they may constitute new matter.** However, because claddings are so notoriously well known in the art, claims 1-21 and 23-30 were objected rather than rejected in the Final Rejection. (See page 2 of the Final Rejection.) **Applicant has neglected to address these**

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claim objections. Therefore, applicant's arguments for non-obviousness of fusion splicing a waveguide "having a core surrounded by a cladding" are unpersuasive for additional reasons.

Third, applicant argues that "none of the elements of the clamp assembly [of Chapman] are capable of holding an optical waveguide having a cross-sectional dimension greater than 400 um." Applicant has not previously presented this argument. Applicant's argument is unpersuasive because it would have been within the skill of one of ordinary skill in the art to alter the clamp assembly of Chapman to accommodate a larger optical fiber. One would have been motivated to do so because when practicing the invention of Chapman in view of Maas, in further view of Walters, one would want to secure and hold both optical fibers as taught by Chapman (See e.g. Fig. 3) and Maas (See e.g. claim 4).

III. Applicant unpersuasively argues that claims 4-5, 21 and 27-28 are non-obvious over Chapman in view of Maas, in further view of Walters, in further view of Eskildsen.

It is noted that claim 4 depends on claim 1; hence the subject matter of claim 1 is inherently included in claim 4. Claim 1 was Finally Rejected under this same art in other grounds of rejection. However, it was not included in the statement of the grounds of rejection here due to a typographical error.

Applicant restates the same unpersuasive argument for Chapman in view of Maas, in further view of Walters as addressed regarding claims 1-3, 6-7, 9, 12 and 23-25 above in section II. Applicant's argument is unpersuasive for the same reason stated above.

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IV. Applicant unpersuasively argues that claims 8, 10-11, 21, 26 and 29-30 are non-obvious over Chapman view of Maas, in further view of Walters, in further view of Huang.

It is noted that claim 8 depends on claim 1; hence the subject matter of claim 1 is inherently included in claim 8. Claim 1 was Finally Rejected under this same art in other grounds of rejection. However, it was not included in the statement of the grounds of rejection here due to a typographical error.

Applicant restates the same unpersuasive argument for Chapman in view of Maas, in further view of Walters as addressed regarding claims 1-3, 6-7, 9, 12 and 23-25 above in section II. Applicant's argument is unpersuasive for the same reason stated above.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.
Respectfully submitted,

James P. Hughes
Patent Examiner
Art Unit 2883



Conferees:

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